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Social competence in children with autism

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Objectives: This paper investigates the associations of social competence with cognitive representation and communication skills in children with Autism Spectrum Disorders (ASD), by measuring these skills in an expansive way through assessing both mental and internal-state understanding, and verbal and non-verbal communication.
Methods: The data were collected from 45 Turkish children (M_{age}=8.52 years, SD=3.05, min-max=3–14) with a diagnosis of ASD. Individual assessments were used to measure mental- and internal-state understanding. Teacher-rated scales were used to assess child's verbal and non-verbal communication skills, and social competence.
Results: The results showed that social competence, cognitive representation, verbal and non-verbal communication skills were all significantly associated, but over and above cognitive representation skills and verbal communication, non-verbal communication had a salient role in adaptive social relationships of children with ASD.
Conclusions: These findings have important applied implications for intervention studies and suggest that improvements of non-verbal communication skills in children with ASD might be important for increasing their positive social relations.

Keywords: autism, autism spectrum disorders, cognitive representation, communication skills, verbal communication, non-verbal communication, social competence, Turkish children

Children with Autism Spectrum Disorder (ASD) show varying levels of difficulties in different domains (Levy *et al*. 2009). The problems in social communication, understanding and using non-verbal communication, and restricted and repetitive behaviors are within the core problems of ASD (APA 2013). These difficulties also include problems in social competence which represents the ability to develop and maintain positive relationships with others while attaining personal goals, via skills such as assertion and cooperation, as well as displaying appropriate reactions in social situations (Rose-Krasnor 1997, Gresham *et al*. 2010). Children with ASD show variations in their social skills, yet correlates of these variations are not well understood. In this study, we aimed to investigate cognitive representation skills (i.e. developmentally earlier mental and internal/physical state understanding) as well as verbal and non-verbal communication skills as possible correlates of individual variation in the social competence of children with ASD, given that these are important contributors to social competence in typically developing children (Gallagher 1993, McCabe and Meller 2004, Longoria *et al*. 2009).

Research to date has generally focused on the role of higher order mental state understanding (e.g. false belief understanding (FBU) which represents an understanding that other persons might have different and false beliefs or representations about the world) in the social competence of children with ASD (e.g. Peterson *et al*. 2007). Yet, more basic features of understanding others' mental states, for instance, the developmentally earlier understanding of others' internal/physical states (e.g. others' feeling cold, hurt) and developmentally earlier task to measure mental state understanding (e.g. the see–know task) are understudied. Thus, the present study provided a novel investigation of how the social competence of children with ASD might be related to early insights into others' mental and internal states as well as their non-verbal and verbal communication skills.

Social competence and representation abilities

The ability to take others' perspectives and to understand that the behaviors of other people are guided by their mental states, which might be different from one's own, are central aspects of theory of mind (ToM; Wellman and Liu 2004). Children with ASD are found to have difficulties in ToM understanding (e.g. Peterson *et al*. 2007). The ToM hypothesis of autism suggests that deficits in ToM are central to understanding the problems of individuals with ASD (Tager-Flusberg and Joseph 2005). Nevertheless, although children with ASD generally display difficulties in various ToM tasks, some display better performance

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than others. For instance, children with ASD require higher verbal mental age and verbal capacities to pass ToM tasks as compared to mentally handicapped and typically developing children (Happe 1995, Tager-Flusberg and Joseph 2005); and children with high functioning autism (who have higher IQ and no indication of mental retardation but who display severe social problems associated with ASD; Sanders 2009) may pass the first-order ToM tasks (e.g. diverse desire tasks which requires an understanding of another person's desire that might be different from one's own), albeit at an older age than the typically developing children (Peterson *et al*. 2005).

The literature on typically developing children has generally shown better social competence in children with more advanced ToM (Walker 2005). Meta-analyses revealed modest but significant associations between ToM and indicators of social competence, like prosocial behaviors (e.g. Imuta *et al*. 2016) and peer popularity (Slaughter *et al*. 2015) in typically developing children. Yet, the literature in children with ASD is relatively scarce and equivocal. On the one hand, several researchers found a non-significant association between ToM and social behaviors in children with ASD, using observations (Travis *et al*. 2001) and parent reports (Frith *et al*. 1994, Dissanayake and Macintosh 2003), especially when child age and verbal ability were controlled for (e.g. Fombonne *et al*. 1994, Peterson *et al*. 2007). Also, some interventions aiming to increase social competence via increasing ToM in children with ASD failed to show improvements in the social domain despite increased mental state understanding (Begeer *et al*. 2011). On the other hand, other researchers reported a significant association between ToM and teacher (Hughes *et al*. 1997) and parent-reported social behaviors (e.g. Tager-Flusberg 2003), especially when social behaviors were measured with items that required a ToM understanding (e.g. 'Chooses appropriate presents', 'Responds to hints and indirect cues in conversation'; Frith *et al*. 1994, and 'Often seem uninterested in your side of the conversation', 'Have difficulty in explaining his/her thinking in words'; Peterson *et al*. 2009) and when linguistic skills were not controlled for (e.g. Fombonne *et al*. 1994). Therefore, the mixed empirical evidence suggests for further investigation of this association.

When measuring ToM, previous studies mostly focused on higher order ToM tasks like FBU, yet, ToM comprises a complex range of insights (Lerner *et al*. 2011). Wellman and Liu (2004) examined the sequence of these diverse mental-state insights, showing that FBU tasks were among the latest to be mastered by typically developing children, as well as children with ASD (Peterson *et al*. 2005). However, our knowledge about the association of developmentally earlier mental state insights with social competence in children with ASD is limited. One of these developmentally earlier components is the ability to understand the relation between perception (seeing) and knowledge (Baron-Cohen and Goodhart 1994, Wellman and Liu 2004). Understanding of the see–know relation was found to be less developed in children with ASD compared to children with specific language impairments and age- and verbal ability-matched typically developing children (Leslie and Frith 1988, Lind and Bowler 2010). Thus, independent of their problems in language, children with ASD displayed difficulties in understanding see–know relation.

An even earlier insight involves making inferences about others' unobservable inner physiological states like feeling cold, tired, or hurt (Lind and Bowler 2010). Lind and Bowler (2010) designed a task that measures understanding of inner physiological states as a control task (e.g. understanding that someone is cold, tired etc.). This task is similar to the see–know task in the way that both tasks require remembering an agent's action and making inferences. In this task, the children are expected to understand the physiological state of a person based on a person's pervious action (e.g. understand that the child who played in the snow would get colder than the child who stayed indoors by the fire); while in the see–know task, the children are expected to have an understanding of another person's knowledge based on previous action (e.g. understand that a person who has looked at the inside of an opaque box would know what it contains yet a person who has not looked in the box would not know what it contains). Therefore, only the see–know task requires an understanding of mental states. Lind and Bowler (2010) found that understanding of internal physiological states was poorer in children with ASD than in typically developing and intellectually impaired children. Nevertheless, understanding and using physiological terms are seen as indicating the onset of a rudimentary ToM capacity at a young age (2 years) in typically developing children (Bretherton *et al*. 1981). For this reason, we used this task along with the see–know task to examine links to ASD children's social competence.

Previous studies have generally targeted higher order mental state understanding tasks to measure their association with social competence yet, have not investigated the roles of these developmentally earlier insights (see Wellman and Liu 2004) in the social competence of children with ASD. It is plausible that understanding these earlier insights might be easier for children with ASD as compared to understanding the developmentally later mental state understanding skills. For instance, in the study of Happe (1995) the children with ASD generally failed the FBU tasks, with only 20% of children passing these tasks. In their study, Lind and Bowler (2010) measured cognitive representations with developmentally earlier tasks (i.e. see–know ability and internal-state understanding) and found that 60% of the children with ASD (who were similar in chronological age, verbal mental age, and verbal IQ with children in Happé study) passed the task. It is possible that children with better understanding of these earlier insights might be having better social relationships, although no studies have yet investigated this link. The

present study aimed to fill this gap by measuring these developmentally earlier cognitive representation abilities by measuring the see–know (mental-state) understanding and internal-state understanding tasks, as opposed to the more developmentally advanced FBU tasks.

In children with ASD, although having a more advanced ToM understanding is associated with better social competence in some studies (Hughes *et al*. 1997), even the ones who pass the FBU tasks were found to display poorer social skills than typically developing children who fail (Peterson *et al*. 2009). Therefore, having better representation abilities per se may not be sufficient for social relationships. There are at least two possible reasons for this lack of a relation. First, several authors (e.g. Frith *et al*. 1994) suggested that children with ASD "hack" their way through FBU tasks, using some strategies (e.g. using reasoning and rule based-understanding that they gained from previous experience) which would allow them to pass FBU tasks without having a real understanding the mental states of others. Therefore, success in the FBU tasks does not reflect a true understanding of the mental state of others and might not be maintained in real-life situations that are different from previous experience. Second, there is relatively little variance in ASD children's performance on classic ToM (e.g. FBU) tasks used to examine social competence, with most children (with mean chronological age of 8 and mean verbal mental age of 6.5) failing them in general (Peterson *et al*. 2007), while higher verbal mental age and verbal IQ is required for passing such tasks in children (mean chronological age of 12 and mean verbal mental age of 6.3) with ASD (e.g. Happe 1995). Therefore, the variance in the performance of children with ASD in ToM tasks is low, implying that these tasks will be a relatively poor correlate of the social competence of ASD children. In contrast, there is more variance in the performance of children with ASD on developmentally simpler tasks such as understanding the see–know relation and understanding physiological states, since more children with ASD (with similar chronological and verbal mental ages and verbal IQ) pass these tasks (e.g. 60%; Lind and Bowler 2010) as compared FBU tasks (e.g. 20% Happe 1995). Therefore, we hypothesized that these earlier insights might be more likely to correlate with the social competence of children with ASD.

Social competence and communication skills

Children with ASD are prone to displaying difficulties in both expressive and receptive language skills (Charman *et al*. 2003) and in turn, they generally have less positive social outcomes like being excluded from peer groups (Syriopoulou-Delli *et al*. 2016), all of which contribute to their social competence problems. In children with ASD, verbal communication skills, especially grammar knowledge, were found to lead to success in FBU tasks (Tager-Flusberg and Joseph 2005, Paynter and Peterson 2010). Furthermore, even when controlling for intelligence, better language in early childhood (preschool ages) is an important predictor of better social functioning in later childhood (Luyster *et al*. 2007) and adulthood in ASD (Gillespie-Lynch *et al*. 2012). Therefore, verbal communication skills are an important contributor to social skills and mental state understanding in children with ASD.

Non-verbal communication is also an important indicator of social competence (Sigman and Ruskin 1999). This includes using and understanding eye-contact, gestures, and joint attention. Impaired communication skills, including problems in non-verbal communication and misattributing the non-verbal intentions of others, is one of the core difficulties defined in the classification of ASD (American Psychiatric Association 2000), with such children demonstrating problems in both using and comprehending non-verbal communication (Stone *et al*. 1997, Maljaars *et al*. 2011). The difficulties in joint attention were reported to predict the social problems of children with ASD (Charman 2003), and higher responsiveness to joint attention in children (2–6-year olds) with ASD is related to better social competence in adulthood (Gillespie-Lynch *et al*. 2012). Moreover, interventions targeting improvement in non-verbal communication are related to improvement in social skills (Ingersoll and Gergans 2007).

To summarize, the extant literature shows that children with ASD usually display difficulties in understanding others' mental states and in verbal and non-verbal aspects of communication, and these problems negatively influence their social development concurrently and longitudinally (Tager-Flusberg 2003, Gillespie-Lynch *et al*. 2012). Previous studies have investigated the role of higher order mental state insights, like FBU, in social competence of children with ASD, without examining the role of more primary insights (Hughes *et al*. 1997). Moreover, even though both verbal and non-verbal communication skills are important predictors for the social functioning of children with ASD, previous studies rarely controlled for the role of both in social competence. ToM and communication skills are also highly correlated in typically developing children and in children with ASD (Mundy *et al*. 1990, Happe 1995, Jenkins and Astington 1996), yet knowledge about the relative contributions of verbal versus non-verbal communicative skills or mental state understanding in social competence in ASD is limited. The current study aimed to fill this gap. We hypothesized that verbal and non-verbal communication skills would be positively related to the social competence of children with ASD; and insight into seeing and knowing and physiological states might also correlate with the social competence given that they might help them understand people better.

Method

Participants

Data were collected from 56 Turkish children with a diagnosis of ASD, their mothers and teachers in special

education centers. All children were diagnosed with ASD by a child psychiatrist or a child neurologist, based on DSM-IV-TR criteria (American Psychiatric Association 2000). Children with problems in self-care abilities, diagnosis of severe intellectual disability (based on DSM-IV criteria) or with any known syndromes like Fragile X, dimorphism or organ anomalies, as well as children without any linguistic capacity defined as no words at age two or no phrases at age three (as reported by pediatricians, child psychiatrist or neurologists, and/or mothers) were not recruited for the study. Eleven children were excluded from the data: nine were unable to pay attention to the study material and two with echolalia were unable to provide concrete answers to study questions. Therefore, the final data-set was composed of 45 children. The age of boys (n=34, M=8.55 years, SD=3.04) and girls (n=11, M=8.41 years, SD=3.22) did not differ significantly; $F(1, 43)$=.02, P=.89, η^2=.00.

Nearly 75% of the children were diagnosed with ASD before the age of 3, and 57% started to receive special education at this age. All children were attending to a special education center. These special education centers all use Applied Behaviour Analysis, providing group and one-on-one individual therapy. On average, children spent about 4.5 h/week (SD=5.46) in the special education centers. Most of the children (86.7%) were also attending a daycare center, kindergarten, elementary school, or elementary special education school. All children were from intact families, and most were from low and low-middle socioeconomic backgrounds. Monthly household income was less than 1500 Turkish Liras (about $500) for approximately 50% of the families.

Procedure

After approval was obtained from the university research ethics board, participants were recruited from one university hospital and seven special education centers in Istanbul, Turkey. Mothers who gave written informed consent were asked to complete the demographic information form and special education teachers who knew the child for the longest time (M=50.79 months, SD=35.02, range=1–142 months) completed the scales for social competence, verbal, and nonverbal communication. These tasks were administered to teachers, since they were highly knowledgeable of the assessed behaviors and difficulties, and had extensive experience with these children and in general with youth with ASD, allowing them to understand the delays and deviances in children better and detecting even subtle forms of social differences in children (Hughes *et al*. 1997). Moreover, teachers were found to be reliable informants regarding child social competence in previous studies (e.g. Hughes *et al*. 1997, Peterson *et al*. 2007). The internal-state and mental-state understanding tasks were administered to the child by a female experimenter in a quiet room in the centre/hospital.

Measures

Background information

Mothers completed a demographic form to provide information about the child and the family. Parents' education were rated on a 10-point Likert scale (1 = primary school drop-out, 10 = graduate degree). Approximately 25% of the mothers and 20% of the fathers were primary school graduates, and about 26% of mothers and 36% of fathers completed four years of university education or more. Associations among mother's and father's education level and household income were significant (rs between .70 and .73; P<.001); so they were converted to standardized (z) scores and averaged to derive a total socioeconomic status (SES) score (M=–.21, SD=.86).

Social competence

To measure children's social competence, special education teachers completed the Social Skills subscale of the Social Skills Rating System (SSRS; Gresham and Elliot 1990), which has 11 items that tap cooperation and assertiveness (e.g. 'Helps peers during class-work'). Items are rated on a four-point Likert scale (1 = never, 4 = always) and averaged to obtain the social competence score; therefore, the scores could range between 1 and 4 and higher scores reflected more competence in social interactions. Teachers were provided written information about the scale (e.g. teachers should keep the target child in mind and higher scores indicated higher likelihood of the given behavior), and female research assistants answered their questions, if they had any. This scale has been commonly and reliably used for assessing the social competence of children with ASD (Reichow *et al*. 2012). The scale was translated to Turkish by Sucuoglu and Ozokcu (2005), and had high internal consistency (α=.96). In the present study, the internal consistency was also high (α=.90).

Understanding mental states

Children's mental-state understanding was measured by the see–know task, measuring the ability to understand the link between seeing and knowing (Baron-Cohen and Goodhart 1994). In the procedure (see Lind and Bowler 2010 for a detailed description), the children are shown five different opaque boxes and informed that each box contains a small object. The children are also introduced and familiarized with two dolls (one male and one female) until they can recall their names correctly (in the present study, the dolls were given common Turkish names, Ali and Zeynep). The children are then exposed to a procedure in which one of the dolls opens the lid of the box and looks inside to see what it contains, and the other doll only lifts up the box without opening the lid, hence without seeing its contents. The experimenter then asks the children which doll knows what is inside the box (test question). This procedure is repeated five times with different boxes containing different objects. The order of the stories was counterbalanced across children to minimize

Table 1 Descriptive statistics and zero-order correlations for child age and study variables (N=45)

	Child's age (years)	1	2	3	4	5	6	7
1. Social competence (1–4)[a]	−.06	–						
2. Understanding mental-states (0–5)[a]	.07	.39**	–					
3. Understanding internal-states (0–6)[a]	.08	.35*	.53***	–				
4. Comprehension of speech (0–100%)[b]	−.21	.49***	.42**	.65***	–			
5. Ability to use speech (0–100%)[b]	−.14	.48**	.45**	.63***	.70***	–		
6. Comprehension of non-verbal communication (0–100%)[b]	−.10	.62***	.29+	.51***	.70***	.48**	–	
7. Ability to use non-verbal communication (0–100%)[b]	−.12	.68***	.35*	.50***	.57***	.54***	.58***	–
M	8.52	2.05	2.89	3.80	78.77	67.92	87.04	72.17
SD	3.05	.53	1.76	2.12	25.60	26.86	20.38	23.54
Min	3	1.18	0	0	20	0	16.17	14.29
Max	14	3.27	5	6	100	100	100	100

[a]The numbers in parenthesis represent the minimum and maximum scores possible;
[b]The percentages in parenthesis represent the minimum and maximum percentage scores possible;
+$p < .10$;
*$p < .05$;
**$p < .01$;
***$p < .001$.

possible order effects. The children's correct answers (given a score of 1) were summed to calculate the total mental-state understanding score (possible minimum score was 0 and possible maximum score was 5) and higher scores reflected a better understanding of mental states (see Table 1).

Understanding internal states

To measure understanding of internal states, the procedure used in Lind and Bowler (2010) was utilized. In the task, the child was told six short stories about the two dolls used in the see–know task. The stories required the child to give answers to questions regarding internal, unobservable (but not mental) states of the dolls, including getting hurt, feeling tired, cold, and sick. An example question is: 'It is snowing outside. Zeynep goes outside to make a snowman, while Ali stays indoors by the fire and reads a book. Who gets cold?' (Lind and Bowler 2010, p. 482). The order of these six stories was counterbalanced for each child. The child's correct answers (given a score of 1) were summed to calculate a total score of internal-state understanding (possible minimum score was 0 and possible maximum score was 6) and higher scores reflected better internal-state understanding (see Table 1).

Verbal and non-verbal communication

Children's teachers in their special education centers completed the Schedule of Handicaps, Behaviors, and Skills (HBS; Wing and Gould 1979) to assess child's competency in verbal and non-verbal communication. Because of the delays and deviance in language competence in children with ASD, exclusive use of language tests standardized for typically developing children or sole reliance on the direct assessment methods are not advised (Charman 2004). HBS is a scale specially developed for children with developmental problems including autism (Wing and Gould 1978), and was previously shown to be a reliable and valid instrument for children with ASD (e.g. Gillberg *et al*. 1996). HBS is composed of 33 sections measuring a child's developmental level in different domains like language and abnormal/difficult behaviors. In the current study, the sections of 'comprehension of speech,' 'ability to use speech,' 'ability to understand non-verbal communication,' and 'ability to use non-verbal communication' were used to measure child's communication skills. Each of these sections comprises items that measure the developmental level achieved by the child. The sections are composed of a series of hierarchically ordered answers, in which higher scores reflected higher level of development in the measured skill. When the teachers indicated one skill for the child, the skills that are lower in the hierarchy should have been mastered by the child as well. There were 12 items used in total. As suggested by Bernsen (1980), scoring of the sections was done by taking percentage scores in each section. A child's developmental level in each domain was assessed by adding the score the child received within each section and calculating the percentage competence (see Table 1) so that the minimum score could be 0% and the maximum score could be 100% and higher scores reflected higher competence in the given area.

The comprehension of speech section is comprised of two items: ability to comprehend speech (0 = no response when spoken to, 7 = understands instructions that involve giving decisions) and to understand prepositions (0 = does not understand prepositions such as 'in', 'behind', 'under', 2 = fully understands all of these prepositions). The alpha level for the items was acceptable (α=.64).

The ability to use speech section consists of four items measuring a child's (i) development in grammar (0 = no usage of speech or sounds, or makes incomprehensible noises without meaning, 9 = uses past, present and future tenses, and complex grammatical constructions); (ii) ability to ask questions (0 = does not ask questions, 3 = asks complex 'why' and 'how' questions); (iii) the level of meaningfulness of child's speech (0 = almost all

Table 2 Zero-order correlations among verbal communication, non-verbal communication, cognitive representation, and social competence (N=45)

	1	2	3
1. Social competence	–		
2. Cognitive representation	.42*	–	
3. Verbal communication	.53**	.64**	–
4. Non-verbal communication	.73**	.53**	.70**

*$p < .01$;
**$p < .001$.

or all speech is incomprehensible, 6 = no problems in the meaningfulness of speech); and (iv) the intelligibility of the child's speech (0 = speech is nonsensical, vague and/or out of context, 3 = no problems in the intelligibility of speech). The items had high internal consistency (α=.82).

The comprehension of non-verbal communication is measured with two items tapping the child's ability to understand gestures and bodily movements (0 = no understanding of gestures and bodily movements, 4 = understands complex social gestures and bodily movements), and facial expressions (0 = does not understand facial expressions, 2 = child's behavior can be controlled by even a slight change in the facial expression). The items had acceptable internal consistency (α=.74).

The ability to use non-verbal communication was measured with four items, measuring (i) the abilities to mime gestures and bodily movements (0 = cannot mime bodily movements, 5 = can act little parts in plays/can sing a short song while dancing with appropriate movements and facial expressions); (ii) to use gestures and bodily movements (0 = never nods or shakes head to mean 'yes'/'no', 2 = knows the meaning of these gestures and uses them); (iii) to use facial expressions (0 = face is almost without any expressions, 2 = there are clear changes in facial expressions); and (iv) to use gestures as a substitute for speech (0 = there is no gesture at all, 5 = can show his/her needs by miming). The items had high internal consistency (α=.82).

The scale was translated into Turkish by the authors. Children's special education teachers were provided verbal and written information about how to complete the scale (i.e. informed that they should be selecting the highest achievement the child can perform among the hierarchically ranked answers) and completed it for the children they knew for the longest time or they knew best. There were significant positive correlations between all subscales of verbal and non-verbal communication (see Table 1), and there was a positive correlation between verbal and non-verbal communication scales, similar to the studies conducted with Western samples (e.g. Wing 1981).

Results

Preliminary analyses

Table 1 lists the means, standard deviations, and minimum and maximum values for each of the main variables. Preliminary analyses revealed that all study variables demonstrated acceptable levels of normality. Children mostly displayed poor to moderate levels of social competence: 22 (49%) received a score between 1 and 2, and 21 (47%) received a score between 2 and 3 (out of 4). No child scored 0 and only two children scored above 3. Children's mental-state understanding and internal-state understanding levels were moderate with most children (64.4%) receiving a score of 3 (out of 5) in mental-state understanding task and most (55.6%) receiving a score of 4 (out of 6) in internal-state understanding task. Analysis of verbal and non-verbal communication skills revealed that the highest percentage scores children received were in the comprehension of non-verbal communication, and the lowest scores were obtained in the ability to use speech. In order to ensure that there were no differences in variables based on demographic factors such as children's age or sex, family SES, and the factors related to the child's attendance in the special education center, we conducted ANOVAs and Pearson correlations. There were no significant sex differences, with boys and girls receiving similar scores in social competence ($F(1, 43)=.01$, $P=.95$, $\eta^2=.00$), comprehension of speech ($F(1, 43)=.56$, $P=.46$, $\eta^2=.01$) and use of speech ($F(1, 43)=1.22$, $P=.27$, $\eta^2=.03$), comprehension of non-verbal communication ($F(1, 43)=.48$, $P=.49$, $\eta^2=.01$) and use of non-verbal communication ($F(1, 43)=.08$, $P=.79$, $\eta^2=.00$), mental-state understanding ($F(1, 43)=1.30$, $P=.03$, $\eta^2=.03$), and internal-state understanding ($F(1, 43)=.38$, $P=.54$, $\eta^2=.01$). SES was significantly correlated with the ability to use speech only ($r=.31$, $P<.05$). The child's age, the age at which the child was diagnosed with ASD, the hours the child spent in the special education center, and the age at which the child started to attend a special education center were not significantly associated with any of the study variables (all rs between –.26 and .21, all *ns*).

Zero-order correlations between study variables

We conducted zero-order correlations between study variables and social competence to provide preliminary insight into the associations between variables and their role in social competence. There were significant and positive correlations among all of the study variables (Table 1). These results showed that the developmental skills investigated were all meaningfully linked in varying levels, and pointed to the possibility of some overlap among them.

Regression analyses investigating the role of study variables in social competence

The presence of high correlations between study variables implied possible multicollinearity problems. Indeed, when we conducted regression analysis to examine the individual predictive values of mental- and internal-state understanding and the abilities to comprehend and use verbal and non-verbal communication in social competence, the

Table 3 Regression analysis for social competence (N=45)

	B	SE (*B*)	*β*	*P*
Verbal communication	.02	.10	.03	.88
Non-verbal communication	.42	.09	.69	.00
Cognitive representation	.02	.09	.04	.78
R^2 (Adjusted R^2)	.53 (.50)			

B represents unstandardized regression coefficient; SE(*B*) represents the standard error of the unstandardized regression coefficient; *β* represents the standardized regression coefficient; *P* represents the p-value in the regression equation.

Variance Inflation Factor (VIF) was above 2.5 and the tolerance values were below .40, indicating multicollinearity (Allison 1991). In this case, it is advised to aggregate the variables that are highly correlated and conceptually similar (Tabachnick and Fidell 2007). Thus, we standardized the *comprehension of speech* and *ability to use speech* variables into *z*-scores and took their mean to calculate a composite '*verbal communication*' score. Using the same procedure, we computed a '*non-verbal communication*' composite score from the standardized ability to comprehend and use non-verbal communication scores. Finally, we computed a total '*cognitive representation'* score by averaging the standardized mental- and internal-state understanding scores. In the new regression model with the composite variables, multicollinearity was no longer a problem (indicated by VIF values lower than 2.5 and tolerance values higher than .40). In that model, we examined the predictive values of cognitive representation, verbal communication, and non-verbal communication on social competence in children with ASD (see Table 2 for zero order correlations). Age, sex, and SES were not examined in the regression analysis as they were not related to social competence. Post hoc power analysis was conducted using the GPower software with a sample of 45, three predictor variables in the equation, and $p<.05$. The results revealed that the statistical power of this study was more than .82 for a medium effect and more than .98 for a large effect (Cohen 1992), hence showing adequate power for subsequent analyses. When all three variables were in the equation, non-verbal communication was the only significant predictor of social competence in children with ASD (see Table 3).

Discussion

We assessed early developing insights into other people's internal states (the seeing—knowing link and understanding of physiological states), as well as verbal and non-verbal communication skills, with the aim of examining their concurrent associations with the social competence of children with ASD. Correlational analyses showed that children with ASD with better communication skills and more insight into people's internal states were more socially competent. However, when verbal communication and cognitive representation were accounted for in the regression, non-verbal communication was the only significant factor associated with social competence; those with better non-verbal communication skills had higher social competence.

Previous studies that have examined the association between children's mental state understanding and their social behaviors have generally used developmentally more advanced ToM tasks (e.g. FBU), and obtained mixed findings for children with ASD (e.g. Frith *et al*. 1994, Peterson *et al*. 2007). In contrast, the current study aimed to examine the role of more primitive insights. Although these earlier insights into internal states were significant zero-order correlates of children's social competence, they were not related when children's communication skills were also accounted for. Thus, the present results are in line with previous conceptualizations suggesting that better insight into others' internal states per se might not be sufficient for developing positive relations with others (Peterson *et al*. 2009). The results also resonate with the results obtained in children with high functioning autism, who do not display deficient performance in their ToM understanding yet display impaired social skills (Dissanayake and Macintosh 2003). Moreover, they are consistent with the argument that understanding mental states in laboratory environments might not transform into success in social relations in real life in children with ASD (Peterson *et al*. 2007, Philpott *et al*. 2013), or that intervention-trained ToM understanding might not generalize to natural environments (Begeer *et al*. 2011).

Verbal skills of children with ASD have been found to link closely to their ToM understanding (Tager-Flusberg and Joseph 2005). That is, in order to pass FBU tasks, children with ASD require higher verbal skills (Happe 1995, Peterson *et al*. 2007). It is suggested that children's success on FBU tasks, especially links with grammatical skills, might reflect ASD children's use of linguistic and cognitive heuristics in answering FBU questions, rather than a deeper understanding of other people's mental states (Frith *et al*. 1994).

In the current study, non-verbal communication was operationalized as understanding and using gestures and facial expressions properly and miming these appropriately. Although social competence requires such positive non-verbal communication skills with others, it also includes other skills like cooperation, assertion, and being able to appropriately respond to various situations while initiating and maintaining positive interactions with others (Gresham *et al*. 2010). Current results suggest that non-verbal communication is important in such socially competent interactions in children with ASD. Present results are consistent with previous studies showing that understanding and using non-verbal communication are related to prosocial acts and competence in social interactions in children with ASD (Maljaars *et al*. 2011), and showing that preschool-aged children with ASD with better non-verbal communication skills display higher competence in social functioning in adulthood years (Gillespie-Lynch *et al*. 2012). Likewise, intervention

studies targeting non-verbal communication revealed that children with ASD could acquire skills like joint attention and understanding and using gestures, which were related to increases in social competence (Ingersoll and Gergans 2007). Peterson *et al*. (2007) suggested that children with ASD might need additional motivation for positive social interactions with others, and might require a better understanding of "peers' approval or disapproval, along with ToM, in order to use their social understanding effectively in real-life social situations" (p. 1249). Understanding of the non-verbal communication displayed by others might be an important source for this kind of a relationship and hence might be related to more social competence in children with ASD.

Moreover, researchers argue that non-verbal communication attempts in children represent an early intent to communicate (Bourdais *et al*. 2013). Hence better non-verbal communication capacity might reflect a higher capability or motivation for social responsiveness in children with ASD, which might be an initial step for socially competent interactions. Understanding the meaning of non-verbal communications would allow the child to understand the needs and desires of others (Stone *et al*. 1997), which would increase positive social interactions. Empathy is an important skill facilitating prosocial behaviors and situation-appropriate acts (Eisenberg and Fabes 1998). The situations that require empathic understanding generally occur within contexts requiring individuals to understand the needs of others from non-verbal bids. It is possible that children's understanding of these non-verbal bids and their use of non-verbal communication to indicate their needs might evoke more positive interactions.

There were few previous studies that have examined the associations among different aspects of communication skills and social behavior of children with ASD. In one such study, Kjellmer *et al*. (2012) found that adaptive social functioning in children with ASD was linked with verbal and non-verbal communication, but its association with non-verbal communication was stronger. Similarly, Luyster *et al*. (2007) found that controlling for expressive language, non-verbal gesture use at ages 2–3 was related to adaptive social behaviors at age 9 in children with ASD. Our findings are in line with these studies showing that non-verbal communication might be more important than verbal communication for social functioning in children with ASD. In the current study, the assessment of verbal communication was based especially on grammatical knowledge (e.g. understanding and using certain words like prepositions and following grammatical rules), while the assessment of non-verbal communication tapped pragmatics (e.g. using gestures and facial expressions appropriately). Among communication skills, pragmatics or the social use of language is one of the most challenging for children with ASD (Tesink *et al*. 2009). It is plausible that competence in pragmatic use and understanding of non-verbal communication is essential for initiating and maintaining positive social interactions with others, hence having socially competent interactions, even in the presence of relative verbal proficiency. However, in the present study, verbal and non-verbal communication skills were strongly associated with each other and were strongly associated with understanding cognitive representations. Therefore, the results should be interpreted cautiously, since the literature also shows that non-verbal communication might provide a base for verbal language in ASD (Charman *et al*. 2003). Longitudinal studies are necessary to delineate these possible associations between non-verbal and verbal communication skills as well as social competence in children with ASD.

The limitations of the current study include its cross-sectional design, which does not allow causal explanations. A longitudinal design would allow for a better understanding of the precedence of different cognitive and communicative skills and their effect on the development of social competence in children with ASD. In the current study, we aimed to measure the roles of developmentally earlier cognitive representation skills in social competence of children with ASD. However, we had not used higher order ToM or non-verbal ToM tasks which could have allowed for further comparison across the tasks. If would be beneficial for future studies to also include such tasks. The use of teachers for gaining information about both children's verbal and non-verbal communication skills and for their socially competent behaviors was another limitation. Teachers were selected as informants on these skills because as special education teachers of these children, they were highly knowledgeable about their skills. Although teachers were found to be accurate and reliable informants of children's social competence and communication skills in previous studies (Peterson *et al*. 2007), being rated by the same observer might have increased the shared-rater variance and might have resulted in significant correlations among variables. Therefore, these results have preliminary value and require further replication by future studies that use multiple informants and methods to assess children's skills.

Previous studies indicate that when child social behaviors are measured via items requiring mental state understanding, social competence of children with ASD is related to their ToM understanding (Frith *et al*. 1994). In the current study, we measured child social competence by the SSRS, which measures general social skills including behaviors like assertion and cooperation. Although we intended to investigate the relative roles of cognitive representations and verbal and non-verbal communication skills in general social competence skills, our choice of measurement might be one reason why our results are not consistent with some studies in the literature finding significant associations between ToM and social competence. Finally, children's ASD diagnosis was conducted by a child psychiatrist or child neurologist based on their observations using the DSM-IV-TR criteria since these

were the criteria available at the time of data collection, and are still the criteria used by many practitioners in Turkey, whereas standardized measurement tools for autism (e.g. Autism Diagnostic Observation Schedule; Lord *et al*. 2008) were not used since they were not validated in Turkish. Although previous studies also relied on clinicians' diagnosis (e.g. Peterson *et al*. 2007), not using any standardized measures to diagnose children with ASD and having a poorly specified sample of children with ASD are also potential limitations of the current study.

The strengths of the study include employing multiple assessment methods (individual assessments, teacher ratings), and examining verbal and non-verbal communication as well as the developmentally earlier indicators of ToM understanding (mental and internal state understanding) for their unique contributions on the social competence of children with ASD. In this way, the results extended earlier findings about the factors associated with the social competence of children with ASD, and extended the findings in a cultural context (i.e. Turkish context) with relatively limited research on ASD.

These findings have implications for intervention studies and suggest that improvements of non-verbal communication skills might be important in increasing the positive social relations of children with ASD. Since more competent social relations are related to a variety of positive outcomes in individuals with ASD, this study is an important step in showing the relative importance of insight into internal states versus communication skills, and suggests that non-verbal communication is an important venue for therapeutic interventions for children with ASD to increase their socially competent interactions with others.

Conflict of interest

No potential conflict of interest was reported by the authors.

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